REMARKS/ARGUMENTS

Claims 1-52 were previously pending in the application. Claim 48 is canceled; and claims 5, 7, 31, 38-39, 45-46, and 47 are amended. Claims 5, 7, and 31 are amended to address the § 112 rejections, and claim 47 is amended to include the recitations of claim 48 (now canceled). Assuming the entry of this amendment, claims 1-47 and 49-52 are now pending in the application. The Applicant hereby requests further examination and reconsideration of the application in view of the foregoing amendments and these remarks.

On page 2 of the office action, the Examiner rejected claims 5-8 and 31 under 35 U.S.C. § 112, second paragraph, as being indefinite for insufficient antecedent basis for "the probability of correctly receiving" and "the constellation design." In response, the Applicant amended claims 5, 7, and 31 to correct this insufficiency. The Applicant submits therefore that the rejections of claims under § 112, second paragraph, have been overcome.

Claims 40-41 and 43-44 are allowed. On page 3 of the office action, the Examiner rejected claims 1-4, 9-10, 20-24, 28, 30-31, 37, 42, 45, 47-52 under 35 U.S.C. § 102(b) as being anticipated by Bakke. On page 7, the Examiner rejected claims 5, 11-12, 32-33, 38-39, and 46 under 35 U.S.C. § 103(a) as being unpatentable over Bakke in view of Lane. On page 10, the Examiner objected to claims 13-19, 25-27, 29, and 34-36 as being dependent upon a rejected base claim, but indicated that those claims would be allowable if rewritten in independent form. On page 10, the Examiner stated that claims 6-8 would be allowable if rewritten to overcome the rejections under § 112, second paragraph, and to include all of the limitations of the base claim and any intervening claims.

Since claims 38-39 and 45-46 are canceled, the rejections of those claims are now moot. For the following reasons, the Applicant submits that all pending claims are allowable over the prior-art of record.

<u>Claims 1-36, 38-39, 45-47, and 49-50:</u>

Claim 1 is directed to a receiver for identifying a message based upon a received signal. The receiver has a processor and a comparator. The processor generates minimum and maximum thresholds representing a range for each of a plurality of possible message levels, wherein the sizes of the ranges are different for at least two of the message levels. The comparator identifies the message by comparing the received signal with the generated minimum and maximum thresholds.

In the rejection of claim 1, the Examiner stated:

> Bakke et al teaches a receiver for identifying a message based upon a received signal, the receiver comprising: a processor that generates a minimum threshold and a maximum threshold (see fig. 4 element 260 and 280 and col. 4, lines 8-23) representing a range for each of a plurality of possible message levels, wherein the sizes of the ranges are different for at least two of the message levels (see fig. 3 element I and Q and col. 1, lines 52-67, and col. 3, lines 32-35); and a comparator that identifies the message by comparing the received signal with the generated minimum and maximum thresholds (see col. 4, lines 42-45).

For the following reasons, the Applicant respectfully disagrees with the above characterization of the teachings of Bakke.

Bakke discloses a burst detector for establishing a coarse timing reference at a signal receiver (see, e.g., Fig. 1 and col. 2, lines 39-43). As shown in Bakke's Fig. 2, the burst detector has a signal power detector 210, a digital filter 220, a subtractor 230, a delay circuit 240, and an edge detector 250. Signal power detector 210 generates signal P(n) corresponding to the power magnitude of the combination of the digital in-phase signal (I) and the digital quadrature signal (Q). Digital filter 220, which has an impulse response corresponding to the expected burst, filters signal P(n) to produce signal A(n). Subtractor 230 subtracts a delayed version of signal A(n), which is produced by delay circuit 240, from signal A(n) to generate detection signal D(n). Edge detector 250 then detects an edge of signal D(n) to establish the coarse timing reference T1 (see, e.g., col. 3, lines 30-41).

Bakke's Fig. 3 illustrates representative signals P(n), A(n), and D(n) in the burst detector, and Bakke's Fig. 4 shows implementation details of edge detector 250. According to Fig. 3, signal D(n) has a maximum at time T2 and a minimum at time T3. Edge detector 250 is designed to determine time T2 or time T3, or both and, based on this determination, determine reference time T1 by extrapolation. To realize this functionality, edge detector 250 has a maximum threshold detector 260, a minimum threshold detector 280, and a timing distance detector 270 (see Bakke's Fig. 4), wherein: the maximum threshold detector determines time T2; the minimum threshold detector determines time T3; and the timing distance detector performs the extrapolation, based on the determined values of T2 and T3, to determine reference time T1 (see, e.g., col. 4, lines 24-46).

It appears that the Examiner interpreted maximum threshold detector 260 and minimum threshold detector 280 to be analogous to the "processor that generates a minimum threshold and a maximum threshold representing a range for each of a plurality of possible message levels, wherein the sizes of the ranges are different for at least two of the message levels" recited in claim 1. However, the only description of the thresholds used in Bakke's threshold detectors 260 and 280 (found in col. 4, lines 16-23) reads as follows:

> [T]he time of the maximum and/or the time of the minimum can be determined by thresholding. The maximum threshold detector 260 thresholds the detection signal D(n) to determine if the maximum of the detection D(n) is greater than a maximum threshold. The minimum threshold detector 280 thresholds to determine if the detection signal D(n) is less than a minimum threshold.

Based on this description, it is clear that each of Bakke's threshold detectors 260 and 280 is a simple comparator circuit, the minimum and maximum threshold values are inputs to the threshold detectors, and these threshold values are not generated in the threshold detectors. The Applicant submits that there is no teaching or suggestion in this description of threshold detectors 260 and 280 that (1) their thresholds are somehow related to "possible message levels" (e.g., the amplitude of signal D(n)) and/or (2) "the sizes of the ranges" (e.g., the difference between their threshold levels) are "different for at least two of the message levels" (e.g., two different amplitudes of signal D(n)).

In the above-cited rejection of claim 1, the Examiner points to Bakke's Fig. 3 and text in col. 1, lines 52-67, and col. 3, lines 32-35, to support his conjecture that Bakke teaches the limitation of "the sizes of the ranges are different for at least two of the message levels." However, Fig. 3 does not even show the threshold levels, which would indicate "the sizes of the ranges." Similarly, the cited text does not talk about the threshold levels or "the sizes of the ranges" at all. For example, the text in col. 1, lines 52-67, reads as follows:

> Thus, as the frequency difference increases, the received signal and expected pattern become increasingly decorrelated and hence more difficult to establish a timing reference. In another

known receiver, such as a Rake receiver, multiple receiver paths each having a different frequency offset perform simultaneous correlation with an expected pattern to establish a time reference. As a result of having multiple receiver paths, the frequency difference seen by one of the receiver paths may be small enough to get an adequate detection of a correlation peak. However, this approach requires multiple receiver paths adding additional cost and complexity to the receiver. Furthermore, the multiple receiver paths require additional processing time and could cause delays before a choice between the multiple paths can be made.

The Applicant does not understand how this description can possibly teach or even suggest the limitation of "the sizes of the ranges are different for at least two of the message levels."

In view of the foregoing, the Applicant submits that Bakke does not teach or even suggest "a processor that generates a minimum threshold and a maximum threshold representing a range for each of a plurality of possible message levels, wherein the sizes of the ranges are different for at least two of the message levels," the Examiner's statement to the contrary notwithstanding. It is therefore submitted that the Examiner mischaracterized the teachings of Bakke and used them improperly to reject claim 1. As such the rejection of claim 1 over Bakke should be withdrawn.

Lane teaches a circuit (e.g., circuit 500 of Fig. 5) designed to determine the constellation size of a quadrature amplitude modulated (QAM) signal. More specifically, circuit 500 is designed to determine whether a received QAM signal is a 16-ary or 32-ary QAM signal (see, e.g., col. 9, lines 15-18). Circuit 500 operates by first squaring and normalizing the received QAM signal, and then analyzing the probability distribution function (pdf) of the normalized signal accumulated over a predetermined period of time (see, e.g., col. 7, lines 13-44). For the pdf analysis, circuit 500 has two bins labeled BIN 2 and BIN 3 in Fig. 5. Each bin is configured to count instances of signal occurrence within the bin boundaries that are defined by the levels of the corresponding upper and lower threshold signals applied to the bin comparators (i.e., comparators 512 and 514 of BIN 2 and comparators 516 and 518 of BIN 3). The level difference between the upper and lower threshold signals determines the bin width for each of the bins (see, e.g., col. 8, lines 12-14). The number of counts produced in each bin are compared with one another at the end of the accumulation period to determine whether the QAM signal is 16-ary or 32-ary.

Regarding circuit 500 (Fig. 5), Lane explicitly teaches that BIN 2 and BIN 3 have the <u>same width</u> with a value of, e.g., 0.25 of the normalized power (col. 8, lines 12-26). More specifically, Lane teaches that (I) one of the bins has threshold levels of 0.375 and 0.625 (col. 8, lines 17-20) and (II) the other bin has threshold levels of 0.875 and 1.125 (col. 8, lines 23-26). As such, both BIN 2 and BIN 3 have the same width (i.e., 0.625-0.375=1.125-0.875=0.25). The Applicant submits that nowhere in the description of circuit 500 (see columns 7-10) does Lane teach or even suggest bins (message levels) having different widths (sizes of the ranges).

Furthermore, the sole purpose of Lane's Fig. 3 is to teach how to choose a <u>single optimal width</u> value that would work relatively well for both 16-ary and 32-ary QAM signals. More specifically, curves 302 and 304 of Fig. 3 show the probability of error as a function of bin width for 16-ary and 32-ary QAM signals, respectively. Based on these curves Lane specifies that, to minimize the probability of error, a single optimal bin width should be selected from values between 0.25 and 0.3 of the normalized power (col. 6, lines 57-60). Lane seeks a uniform configuration for all bins and explicitly provides that a single compromise bin width should be selected. According to Lane, this compromise bin width should correspond to neither of the curve minima, but, rather, belong to a range (0.25 to 0.3) located between the curve minima. In view of (i) Lane's lack of recognition of possible use of different widths in different bins and (ii) the explicit teaching directed to the selection of a single optimal width for all bins, the

Applicant submits that not only Lane does <u>not</u> teach or suggest different widths for different bins, he, in fact, teaches away from selecting different widths for different bins.

For all these reasons, the Applicant submits that claim 1 is allowable over Bakke and Lane, taken independently or in combination. For similar reasons, the Applicant submits that claims 10, 20, 21, and 47 are also allowable over Bakke and Lane. Since claims 1-9, 11-19, 22-36, 38-39, 45-46, and 49-50 depend variously from claims 1, 10, 20, 21, and 47, it is further submitted that those claims are also allowable over Bakke and Lane. In view of the foregoing, the Applicant submits that the rejections of claims 1-36, 38-39, 45-46, 47, and 49-50 under §§ 102 and 103 have been overcome.

<u>Claims 2, 22, 37, and 42:</u>

Claim 37 is directed to a receiver for identifying a message based upon a received signal. The receiver has a processor and a comparator. The processor generates a minimum threshold and a maximum threshold representing a variable range for each of a plurality of possible message levels in a single constellation design, and the comparator identifies the message by comparing the received signal with the generated minimum and maximum thresholds, wherein the minimum and maximum thresholds are a function of an interrelationship between noise and the message level.

As already indicated above, each of Bakke's threshold detectors 260 and 280 is a comparator circuit, and there is no teaching or suggestion in Bakke that, in these comparator circuits, the utilized thresholds are somehow related to "the message levels" (e.g., the amplitude of signal D(n)). Similarly, there is no teaching or suggestion in Bakke that, in the comparator circuits, the utilized thresholds are somehow affected by the noise. It is therefore submitted that Bakke does not teach or suggest at least the limitation of "wherein the minimum and maximum thresholds are a function of an interrelationship between noise and the message level," and the rejection of claim 37 over Bakke is improper and should be withdrawn.

For the above-stated reasons, the Applicant submits that claim 37 is allowable over Bakke. For similar reasons, the Applicant submits that claim 42 is also allowable over Bakke. Claim 2, which depends from claims 1, also has the limitation of "wherein the minimum and maximum thresholds are a function of an interrelationship between noise and the message level." Claim 22, which depends from claims 21, has a similar limitation. Since Bakke does not teach or suggest this limitation, this fact provides additional reasons for the allowability of claims 2 and 22 over Bakke.

<u>Claim 31:</u>

Claim 31, which depends from claims 21, 28, and 30, recites a method of identifying a message having the step of <u>adjusting a constellation design</u> such that the distance $d(i) > d_{min}$ for all received signal levels in the constellation design.

As already discussed above, Bakke teaches a burst detector for establishing a coarse timing reference at a signal receiver. (see, e.g., Fig. 1 and col. 2, lines 39-43). As such, the burst detector of Bakke simply accepts the constellation design used by the transmitter and <u>cannot</u> in any manner change or adjust that design. Therefore, Bakke does not teach or even suggest a method of identifying a message having the step of adjusting a constellation design such that the distance $d(i) > d_{min}$ for all received signal levels in the constellation design. Similarly, Lane teaches a circuit designed to determine the constellation size of a QAM signal. As such, the circuit of Lane simply accepts the constellation design used by the transmitter and <u>cannot</u> in any manner change or adjust that design. Therefore, Lane does not teach or even suggest a method of identifying a message having the step of adjusting a constellation

design such that the distance $d(i) > d_{min}$ for all received signal levels in the constellation design. These facts provide additional reasons for the allowability of claim 31 over Bakke and Lane.

Claims 51-52:

Claims 51 and 52 depend from claim 41. Since claim 41 is allowed, the Applicant submits that claims 51-52 are allowable.

In view of the above amendments and remarks, the Applicant believes that the now pending claims are in condition for allowance. Therefore, the Applicant believes that the entire application is now in condition for allowance, and early and favorable action is respectfully solicited.

Respectfully submitted,

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